Small Business Innovation Research/Small Business Tech Transfer

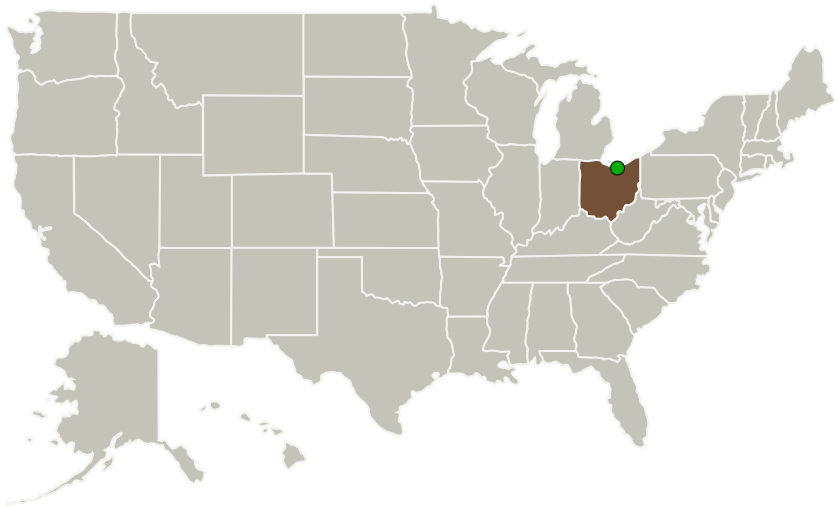
Low AC-Loss Superconducting Cable Technology for Electric Aircraft Propulsion, Phase I

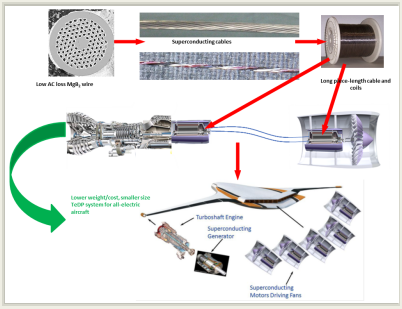
Completed Technology Project (2017 - 2017)

Project Introduction

The availability of low AC loss magnesium diboride (MgB2) superconducting wires enables much lighter weight superconducting stator coils than with any other metal or ceramic superconductor. This, together with Hyper Tech's capability to fabricate long piece-length (potentially 60 km) wires, in turn enables lighter superconducting motors/generators, essential components in the turboelectric aircraft propulsion system with high power densities (over 10 kW/kg) envisioned in next generation Air Vehicle Technologies. To that end, this proposed SBIR Phase I program focuses on developing MgB2 multifilament superconducting cables with exceptionally low AC losses (targeting a loss budget of 1 W/cm3) because superconductors in a cable form is arguably the only easily-accomplished and viable way to push down AC losses while retaining high operating current levels in the stator coils. Two recent advancements at Hyper Tech greatly increase the odds of success in developing superconducting cable technology in the Phase I: 1) the development of cutting-edge superconductor strand architecture designs with fine filaments, small twist pitches and resistive components for reducing AC losses and 2) improved wire manufacturing capability to fabricate multi-strand cables. A second benefit of using superconducting cable technology, beyond AC loss reduction, is the much lower heat load produced by the conductor.

Primary U.S. Work Locations and Key Partners





Low AC-Loss Superconducting Cable Technology for Electric Aircraft Propulsion, Phase I Briefing Chart Image

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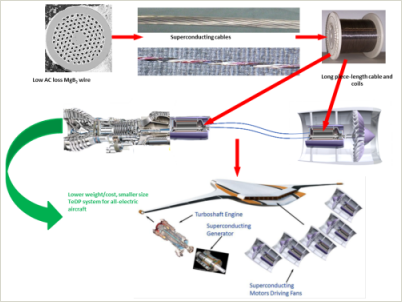
Organizations Performing Work	Role	Type	Location
Hyper Tech Research, Inc.	Lead Organization	Industry	Columbus, Ohio
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations
Ohio

Images



Briefing Chart Image
Low AC-Loss Superconducting Cable Technology for Electric Aircraft Propulsion, Phase I Briefing Chart Image
(https://techport.nasa.gov/image/133205)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Hyper Tech Research, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

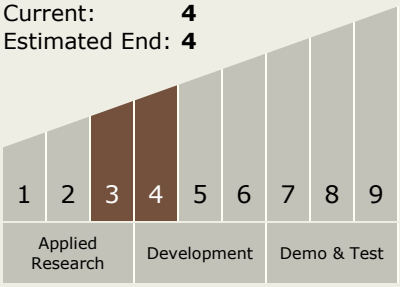
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Matthew Rindfleisch

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Low AC-Loss Superconducting Cable Technology for Electric Aircraft Propulsion, Phase I

Completed Technology Project (2017 - 2017)

Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.3 Aero Propulsion
    - TX01.3.9 Hybrid Electric Systems